

A new species of *Carinatogecko* (Sauria: Gekkonidae) from Ilam Province, western Iran

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Abstract.—A new keel-scaled gecko, *Carinatogecko ilamensis* sp. nov. (Squamata: Gekkonidae), is described from the western foothills of the Zagros Mountains in the Zarinabad region, Dehloran Township, Ilam Province, western Iran. It is a large *Carinatogecko* (snout-vent length exceeds 35 mm) which has distinct differences from other species of *Carinatogecko*: 1) postmentals absent, 2) dorsal crossbars broad and equal to, or wider than, interspaces; broader than dorsal crossbars of the three other *Carinatogecko* species. Some information about the habitat of the new taxon and the role of the Zagros Mountains in isolation and subsequent evolution of *Carinatogecko* is provided. Comparisons with other species of *Carinatogecko* and *Bunopus tuberculatus*, as representative of the genus *Bunopus*, are presented. An updated key to the genus *Carinatogecko* is given.

Key words. Gekkonidae, *Carinatogecko*, *C. ilamensis* sp. nov., *C. stevenandersoni*, *C. heteropholis*, *C. aspratilis*, Ilam Province, Iran

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Introduction

The first specimen of the keel-scaled gecko was collected by Robert G. Tuck, Jr., and described by S. C. Anderson (1973) from 35 km east of Gachsaran, Fars Province, southwestern Iran. At that time, it was identified as *Bunopus aspratilis* (Anderson 1973: 355-358). Then, this taxonomic entity was elevated to the generic level, *Carinatogecko*, by Golubev & Szczerbak in 1981 (Golubev & Szczerbak 1981: 35-37; Szczerbak and Golubev 1996: 127-130).

The genus *Carinatogecko* Golubev & Szczerbak, 1981 encompasses three species: *C. aspratilis* (Anderson 1973) distributed in southern and southwestern Iran, *C. heteropholis* (Minton, Anderson, and Anderson 1970) distributed in a few areas in the western Zagros foothills of Iran and northeastern Iraq, and *C. stevenandersoni* Torki, 2011, distributed in Lorestan Province, western Iran (Torki 2011).

In this paper, we describe a new species of *Carinatogecko* Golubev & Szczerbak, 1981, point out some notes on the habitat type and flora of the environment, and compare the new species with other described species of *Carinatogecko*.

According to the available data (Leviton et al. 1992; Szczerbak and Golubev 1996; Anderson 1999; Fathin-

ia 2007; Rastegar-Pouyani et al. 2007; Červenka et al. 2010; Torki 2011), the new species belongs to the genus *Carinatogecko* Golubev & Szczerbak, 1981 based on having the following characters: All scales (except rostral, mental, postnasals, and upper and lower labials) strongly keeled; three nasal scales in contact with nostril; digits weakly angular, clawed, not dilated, not webbed nor ornamented, with keeled transverse subdigital lamellae; dorsal scales heterogeneous, small juxtaposed scales intermixed with tubercles; pupil vertical; tail segmented, caudal tubercles with bases in the middle of each segment, separated from or in contact with one another, separated by a ring of scales from the posterior margin of a segment.

Methods and materials

During fieldwork on amphibians and reptiles of Ilam Province, western Iran, two specimens of an unknown gecko were collected in Zarinabad region, Dehloran Township, Ilam Province (Fig. 1). The coordinates of the type locality are 32°57'51" N, 47°03'23" E and 543 m above sea level. The first specimen was collected active at 23:00 p.m. and the second on the following day after

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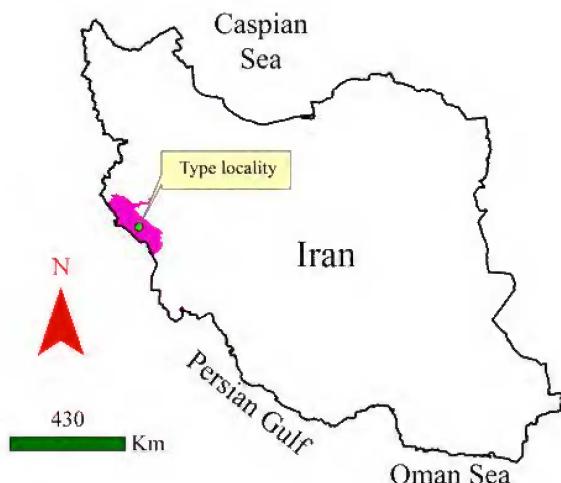


Figure 1. The type locality of *Carinatogecko ilamensis* sp. nov. in Ilam Province, western Iran.

excavating a hole at the foot of a *Capparis spinosa* at 10:00 a.m.

Both holotype and paratype specimens were preserved in 95% ethanol and deposited in RUZM (Razi University Zoological Museum). Some of their characters differ significantly from those of the other three species of *Carinatogecko* (see below). The two unknown specimens were compared with the other three species of *Carinatogecko* (i.e., *C. heteropholis*, *C. aspratilis*, and *C. stevenandersoni*) as well as with the genus *Bunopus* (*B. tuberculatus*; Tables 1-2; Material examined).

Material examined

Bunopus tuberculatus ($n = 5$): RUZM-GB 140.1 – RUZM-GB140.5: Iran, Isfahan Province, Kashan.

Carinatogecko aspratilis ($n = 3$): RUZM-GC 10.1 – RUZM-GC10.3: Iran, Kermanshah Province.

Carinatogecko heteropholis ($n = 22$): RUZM-GC.110 – RUZM-GC.131: Iran, Ilam Province, Shirvan and Chardavol, Karezan, Sarab-e-Karezan village [33°44' N, 46°29' E and 1325 m above sea level].

Carinatogecko ilamensis sp. nov. ($n = 2$): RUZM-GC 120.1 – RUZM-GC 120.2: Iran, Ilam Province, Dehloran Township, Zarinabad region [32°57'51" N, 47°03'23" E and 543 m above sea level].

Results

Carinatogecko ilamensis sp. nov. (Figs. 2-7, 9b, 10a-d, 11c, 12d)

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Holotype

An adult male (RUZM-GC120.1), collected by Hamid Darvishnia on 8 August 2011, 500-600 m above sea level, on the western gypsum foothills of the Zagros Mountains, Zarin-Abad region, Dehloran Township,



Figure 2. The holotype of *Carinatogecko ilamensis* sp. nov. in natural habitat.

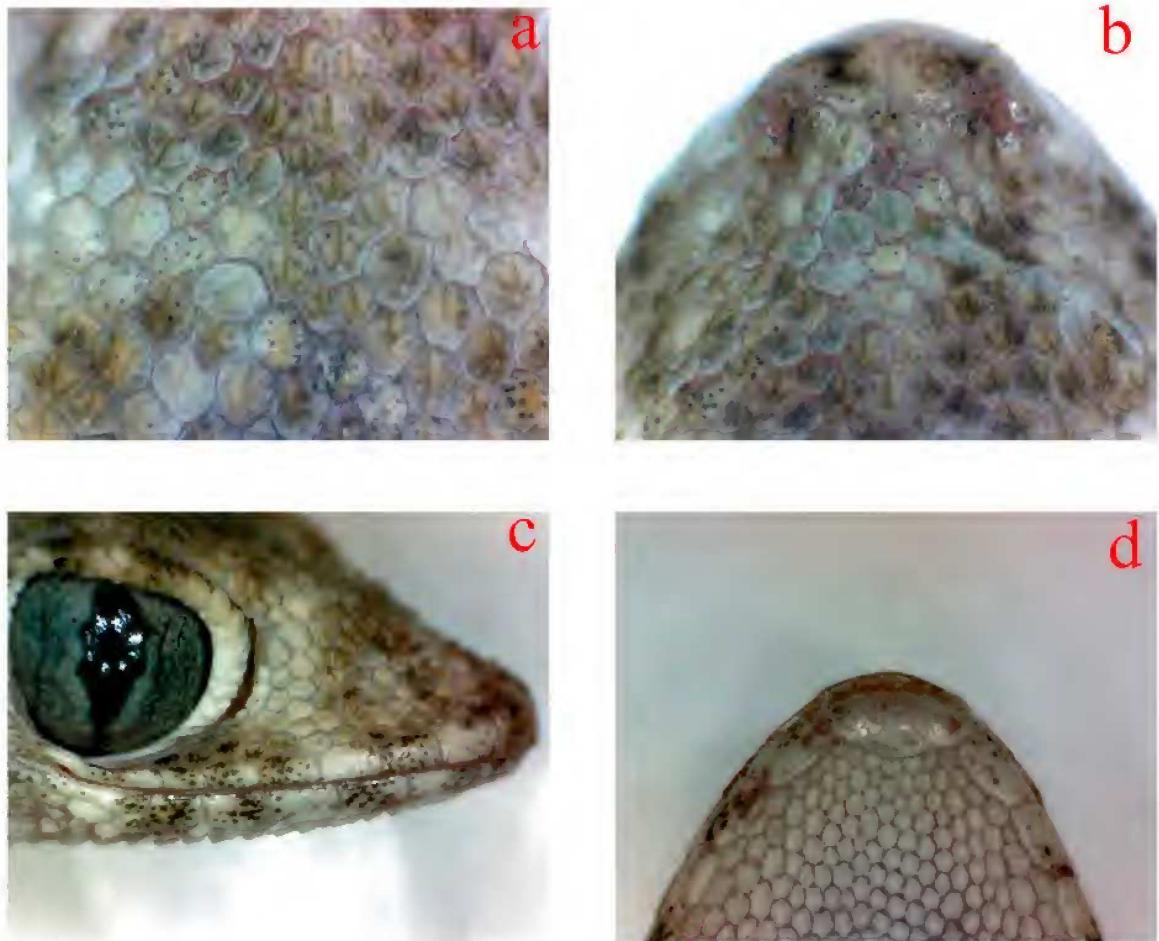


Figure 3. *Carinatogecko ilamensis* sp. nov. a) polyhedral and multi-keeled scales on snout, b) semidivided rostral and five scales between nostril, c) smooth supra- and infralabials, d) absence of postmentals.



Figure 4. *Carinatogecko ilamensis* sp. nov. a) keeled scales and tubercles on dorsum, b) juxtaposed, blunt, keeled ventral scales, c) extending dorsal tubercles onto nape and postorbital regions, but not onto occiput.

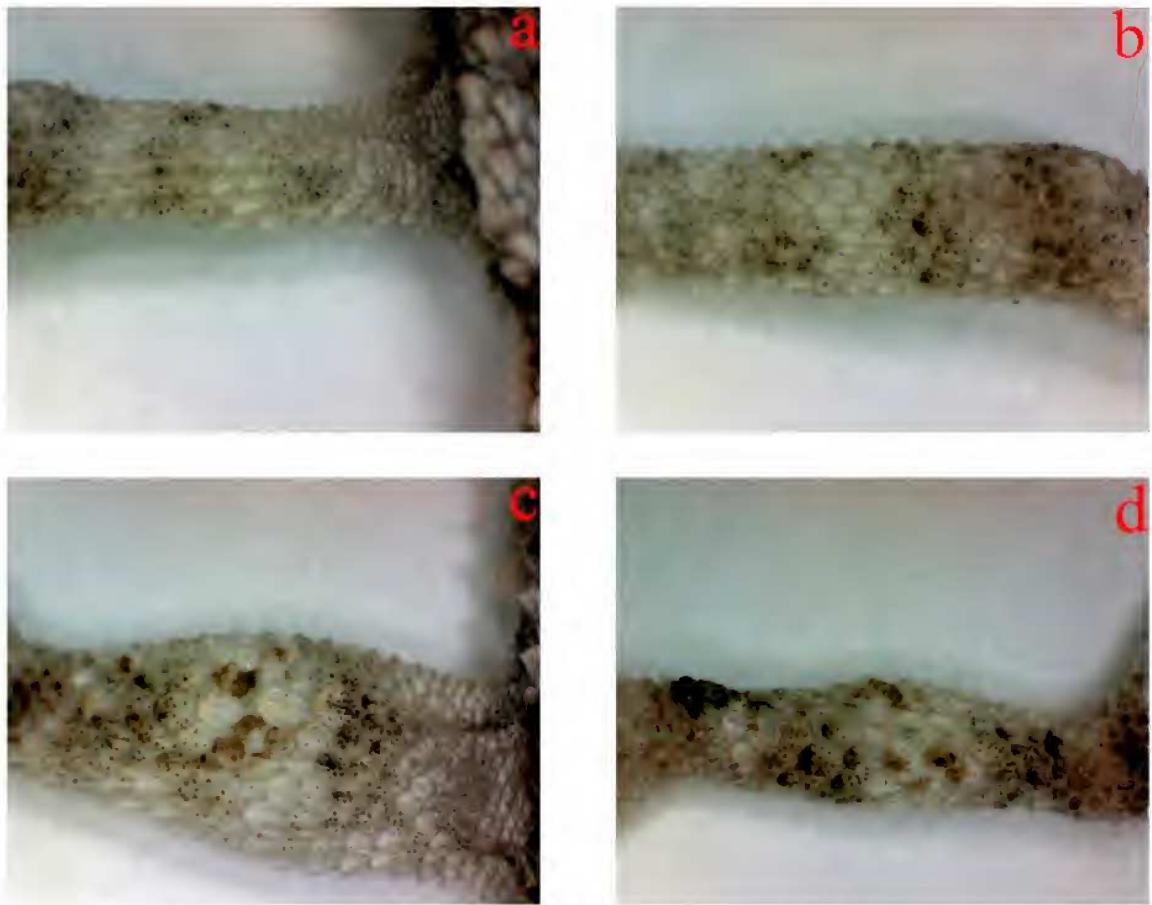


Figure 5. *Carinatogecko ilamensis* sp. nov. a-b) relatively homogenous scales on upper arm and forearm, respectively, c-d) larger dorsal scales and tubercles on thigh and shank, respectively.

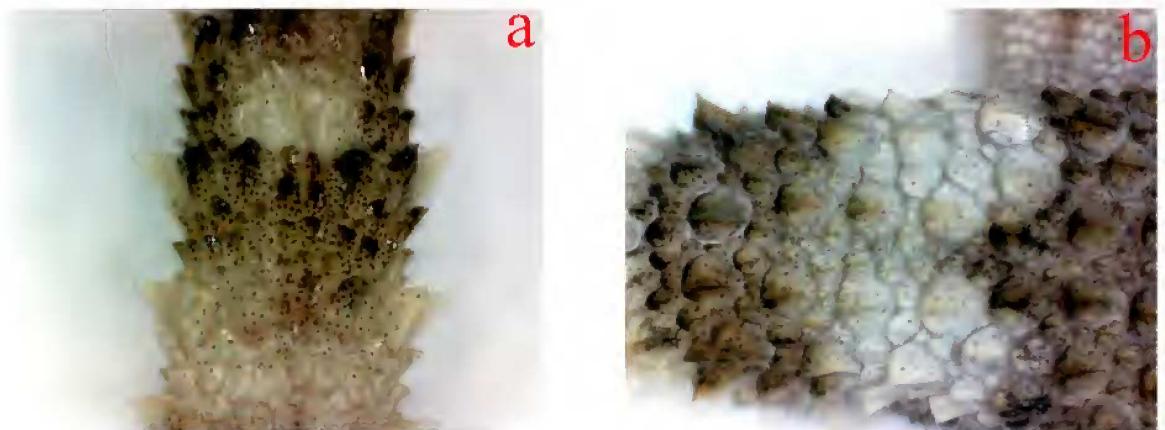


Figure 6a. *Carinatogecko ilamensis* sp. nov. a) mucronate, prominent tubercles on tail, b) comparison of tubercles on sacral region and proximal part of tail.

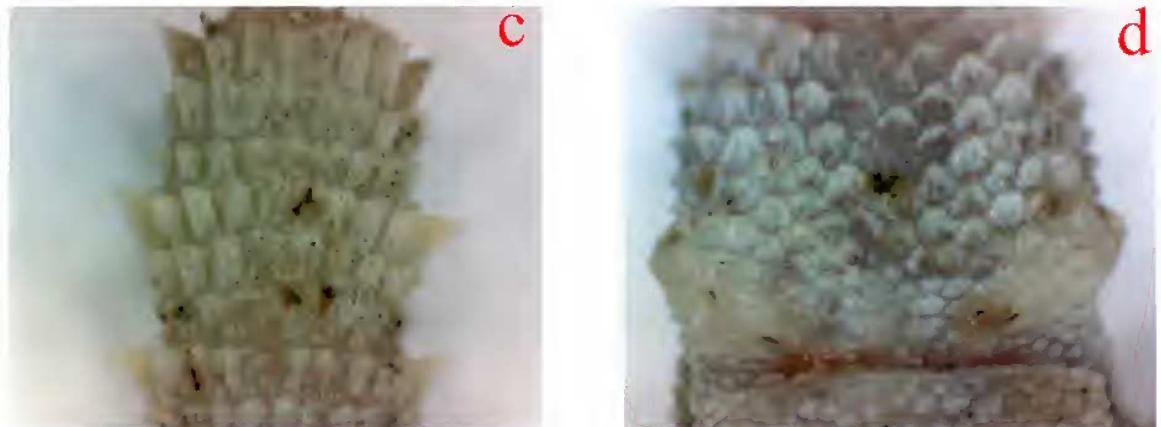


Figure 6b. *Carinatogecko ilamensis* sp. nov. c) keeled scales on ventral part of tail, d) blunt, keeled scales at the base of tail just behind the vent.

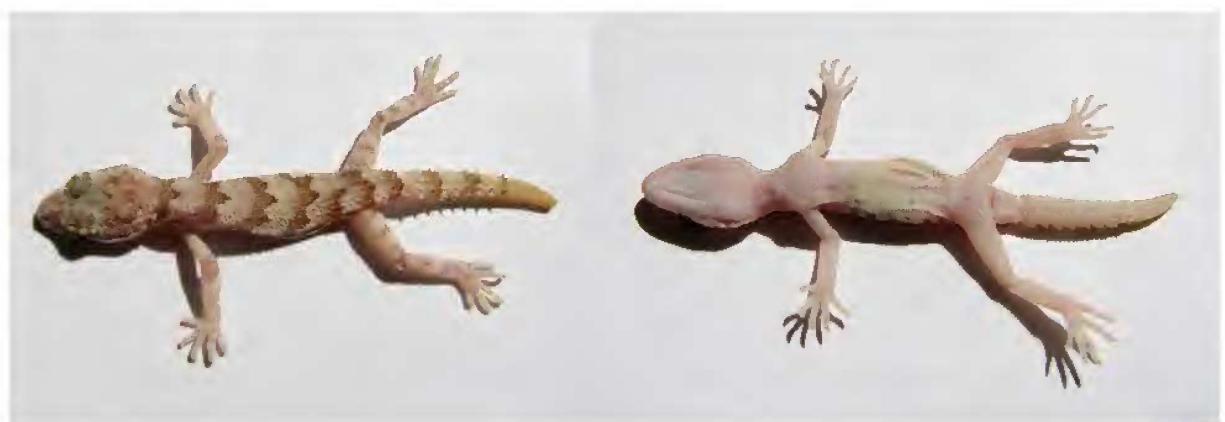


Figure 7. The paratype of *Carinatogecko ilamensis* sp. nov. Dorsal view (left), ventral view (right).



Figure 8. Habitat of *Carinatogecko ilamensis* sp. nov.

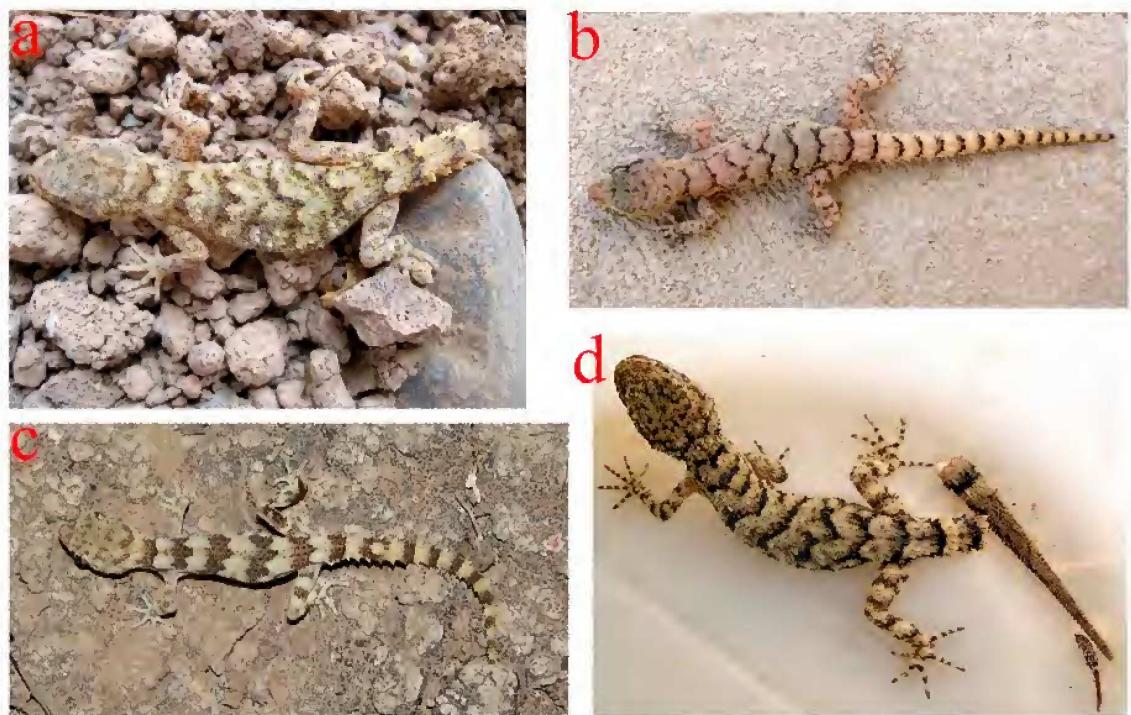


Figure 9. Comparison of dorsal pattern in a) *Carinatogecko aspratilis*, b) *C. heteropholis*, c) *C. ilamensis* sp. nov., and d) *C. stevenandersoni* (d from Torki 2011).



Figure 10. Comparison of mental shape and postmental region in all four species of *Carinatogecko*. a) *C. stevenandersoni*, b) *C. aspratilis*, c) *C. heteropholis*, and d) *C. ilamensis* sp. nov. (a and b from Torki 2011).



Figure 11. Comparison of dorsal pattern in (a) *Bunopus tuberculatus* and (b) *Carinatogecko ilamensis* sp. nov.

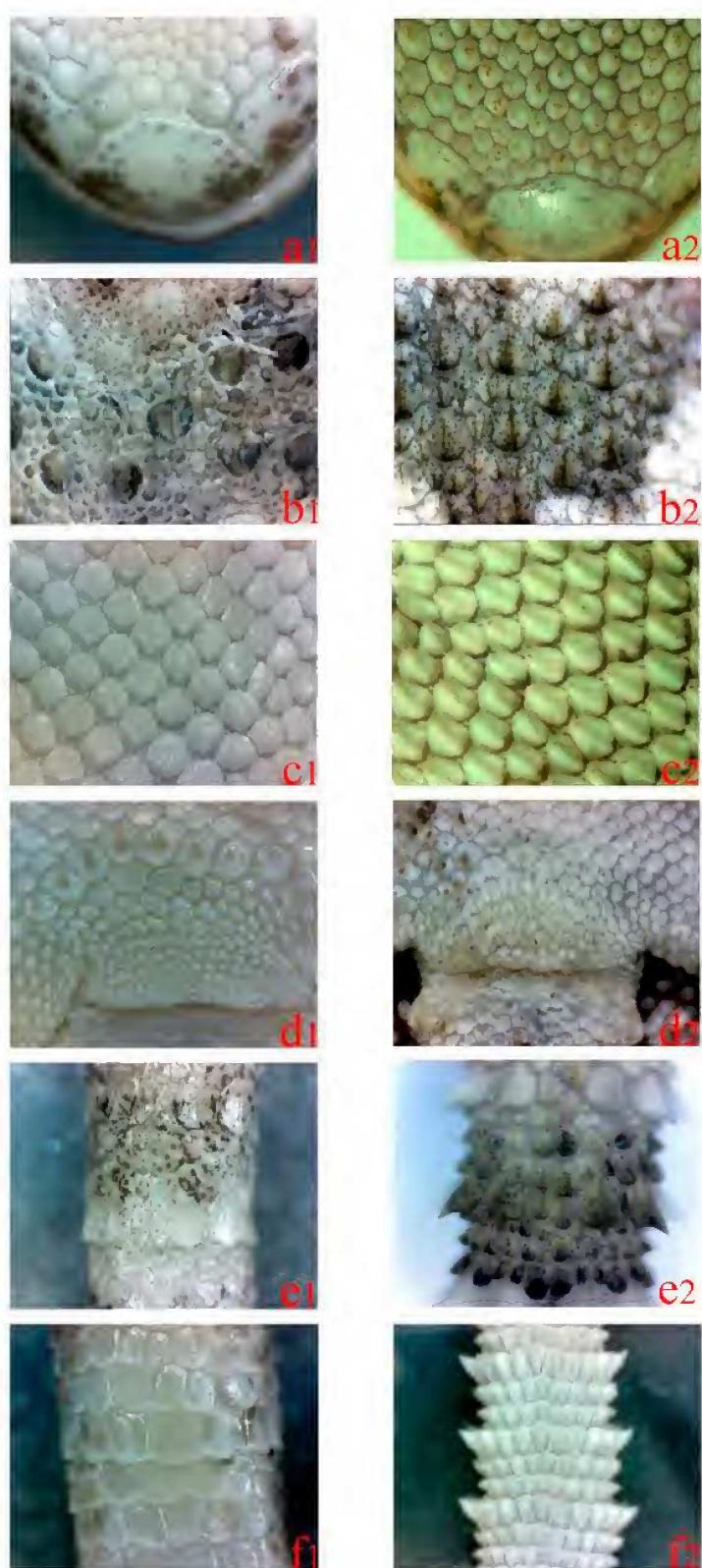


Figure 12. Comparison of a1-a2) mental and gular scales, b1-b2) dorsal pholidosis, c1-c2) ventral pholidosis, d1-d2) preanal pores, e1-e2) upper caudal region, and f1-f2) ventral region of tail in *Bunopus tuberculatus* (left) and *C. ilamensis* sp. nov. (right).

Table 1. Comparison of morphological characters between *C. ilamensis* sp. nov. and *Bunopus tuberculatus* (as the representative of the genus *Bunopus*, Blanford, 1874). Abbreviations: NGBM (number of granular scales behind mental); DS (dorsal scales); VS (ventral scales); PP (preanal pores in males); CDBIN (comparison of dorsal bands in relation to interspaces); DB (dorsal bands); IN (interspaces between dorsal bands); DCS (dorsal caudal scales); VCS (ventral caudal scales).

Characters	<i>Carinatogecko ilamensis</i> sp. nov.	<i>Bunopus tuberculatus</i>
NGBM	6-7 keeled gular scales	3-7 smooth gular scales
DS	large and strongly keeled	small, juxtaposed, and smooth
BS	small, keeled, not imbricate	small, smooth, subcircular, juxtaposed
PP	weakly developed, few in number	well developed, more in number
CDBIN	DB \geq IN	DB much $>$ IN
DCS	keeled	smooth
VCS	keeled, not platelike	smooth, some are platelike

Table 2. Comparison of morphological characters between *C. ilamensis* sp. nov. and the other three species of *Carinatogecko*. Abbreviations: PM (postmentals); SHM (shape of mental); OT (tubercles on occiput); SVS (status of ventral scales); CDBIN (comparison of dorsal bands in relation to interspaces); DB (dorsal bands); IN (interspaces between dorsal bands).

Characters	<i>C. ilamensis</i> sp. nov.	<i>C. aspratilis</i>	<i>C. heteropholis</i>	<i>C. stevenandersoni</i>
PM	absent	three pairs	two pairs	3-4 pairs
SHM	simple	pointed posteriorly	not pointed posteriorly	pointed posteriorly
OT	absent	present	present	present
SVS	not imbricate, not pointed	strongly imbricate, weakly pointed	weakly imbricate, not pointed	weakly imbricate, pointed
CDBIN	DB \geq IN	DB < IN	DB < IN	DB < IN

Ilam Province, southwestern Iran at the coordinates of 32°57'51" N and 47°03'23" E.

of tubercles on back; 30-32 ventral and ventrolateral scales from side to side.

Dorsal regions brownish, ventral regions whitish; complete regular chocolate crossbars across dorsum, limbs, digits, and tail; dorsal side of head spotted; occiput with a transverse dark bar; supra- and infralabials with dark spots; subdigital lamellae keeled.

Paratype

A subadult specimen (RUZM-GC120.2), collected by Behzad Fathinia on 9 August 2011 at the same locality as holotype.

Diagnosis

Snout-vent length (SVL) in holotype and paratype 36.5 and 29.3 mm respectively. As in all congeners, scales and tubercles all over the body strongly keeled (except upper and lower labials, nasals, rostral, and mental); dorsal scales heterogeneous, blunt; enlarged blunt tubercles on dorsum; mucronate tubercles on tail more prominent than tubercles on dorsum; homogeneous scales on forelimbs smaller than those on hindlimbs; tubercles on hindlimb few in number and all smaller than those on dorsum; polyhedral, multi-keeled scales on the head including rostral, prefrontal, and postfrontal regions; no postmental; mental bordered by 6-7 small keeled scales; scales on the ventral surface of head multi-keeled and morphologically different from those on ventral region of body and tail; ventrals equal to dorsals in length; ventral side of tail without large plate-like scales, but with keeled mucronate scales; 10-11 regular longitudinal rows

Description of holotype

Snout-vent length (SVL) 36.5 mm.

a) head (Fig. 3): scales of frontal and supraocular regions toward snout are multi-keeled (in some scales up to six keels) and polyhedral, the keels meeting towards the tip of the scale; rostral smooth and semidivided posteriorly; nine smooth supralabials; nostril surrounded by five smooth scales including: rostral, first supralabial, and three postnasals; five scales between nostrils (first and fifth are smooth, the others keeled); mental smooth; no postmental; mental surrounded by seven small keeled scales posteriorly; seven smooth infralabials.

b) trunk (Fig. 4): all tubercles and scales of dorsum keeled, mostly blunt, a few mucronate; dorsal pholidosis heterogeneous; tubercles of dorsum extending to nape but absent in occiput; 11 longitudinal rows of tubercles on dorsum; dorsal tubercles surrounded by 8-10 smaller scales; 32 uniform ventrolateral and ventral keeled scales in a single transverse row to the point where they are dis-

tinguished from dorsolaterals by different color and size; ventral scales approximately equal to dorsals in length (0.5 mm); five preanal pores.

c) fore- and hindlimbs (Fig. 5): scales on dorsal side of forelimbs homogeneous and smaller than those on hindlimbs; no tubercle on forelimbs; few tubercles on hindlimbs; 17 keeled lamellae under the fourth toe.

d) tail (Fig. 6): caudal tubercles mucronate and more prominent than tubercles on dorsum; six tubercles at the middle of each whorl; tubercles in each whorl are in contact or separated by a small scale; tubercle of each whorl separated from preceding and succeeding whorls by three rows of scales; ventral side of tail without large plate-like scales, smaller blunt, keeled scales at the base of tail just behind the vent, but becoming strongly mucronate and keeled distally.

Color pattern (Figs. 2, 3c, 4b)

A transverse dark bar on occipital region; chocolate spots and stripes on head; dark fine spots on supra- and infralabials; dorsum light brown; five complete transverse blackish bars from nape to sacral region, equal to, or broader than, the lighter interspaces; complete dark crossbars on dorsal side of limbs and digits; 10 distinct brown transverse crossbars on the tail; ventral regions uniformly whitish.

Description of paratype

Snout-vent length (SVL) 29.3 mm.

a) head: rostral smooth and semidivided posteriorly; nostril surrounded by five smooth scales including rostral, first supralabial, and three postnasals; five scales between nostrils, the first and fifth smooth, others keeled; scales of prefrontal, pre-supra- and postoculars, and those behind ears are coarse and multi-keeled, their keels reducing toward parietal and occipital and gradually being replaced by uni-keeled scales; 10-10 smooth supralabials; a single smooth mental; no postmentals; mental surrounded posteriorly by six small keeled scales; 8-8 smooth infralabials.

b) trunk: blunt, keeled tubercles and scales on dorsum, few are mucronate; dorsal scales heterogeneous; 10 longitudinal rows of tubercles; dorsal tubercles surrounded by 8-9 keeled scales; 30 rows of keeled, uniform ventrolateral and ventral scales at the point where they are distinguished from dorsolaterals by different color and size; ventral keeled scales equal to dorsal ones.

c) fore- and hindlimbs: dorsal scales on forelimb homogeneous, smaller than those on hindlimb, tubercles on hindlimb smaller than those on dorsum; 16 keeled tubercles on the fourth toe.

d) tail: caudal tubercles mucronate and more prominent than dorsal tubercles; six pointed tubercles at the

middle of each whorl, in contact with or separated from each other by a small scale; each transverse row of tubercles separated from anterior and posterior rows of tubercles by three rows of keeled, usually blunt scales; all sides of regenerated tail covered with blunt, keeled scales; ventral side of tail without large, plate-like scales, covered by small, pointed, and keeled scales.

Color pattern (Fig. 7)

Dark stripes and spots on dorsal side of head, postorbital, frontal, infra- and supralabials; dorsum brownish white; six transverse chocolate bars on dorsum from nape to sacral region, the fifth partial, others complete; width of dark bars equal to or slightly smaller than light interspaces; dark crossbars on limbs and digits, not reaching ventral surfaces; ventral side of body whitish; dark transverse bars on tail, extending to lateral tail region.

Habitat (Fig. 8)

At the type locality, the natural habitat is composed of gypsum and lime sediments extending beyond the Iranian border westwards into Iraq. According to Mozaffarian (2008), a broad part of Ilam Province is a semi desert region, while other parts have temperate climate and very short winter frost. The type locality coincides with semi-desert region.

Three climatic landscape and vegetation types occur in the province: 1) vast plains of lowland semiarid region, including plains and calcareous foothills, 2) more or less dry Zagrosian oak forest dominated by *Quercus brantii*, and 3) high mountains with cushion-like vegetation (Mozaffarian 2008). The type locality is located within the first of the three above-mentioned climatic types.

Different vegetation types mainly including grasses (Gramineae), bushes and shrubs (Capparidaceae: *Capparis spinosa*, *Cleome oxypetala*; Caryophyllaceae: *Gypsophyla linearifolia*, *G. pallida*; Chenopodiaceae: *Halocharis sulphurea*, *Noaea mucronata*, *Salsola imbricate*; Compositae: *Achillea conferta*; Rosaceae: *Amygdalus arabica*), and sparse trees (*Quercus brantii* and *Pistachia atlantica*) cover the area.

A permanent river (Gorazan River) flows through this area. Both specimens were collected in the foothills approximately 200-500 meters south of the river. The type locality is under grazing by sheep and goat herds belonging to the people of Cham-e-Sorkh village.

There is no information on the conservation status of *Carinatogecko ilamensis* sp. nov.

Sympatric lizards and snakes

Several species of lizards and snakes occur as sympatric, or syntopic, with *Carinatogecko ilamensis* sp. nov.

Among lizards: *Laudakia nupta*, *Trapelus lessonae*, *Eublepharis angramainyu*, *Asaccus elisae*, *Hemidactylus persicus*, *Acanthodactylus boskianus*, *Trachylepis aurata*, *Uromastyx loricata*, *Varanus griseus*; and among snakes: *Typhlops vermicularis*, *Spalerosophis diadema*, *Walterinnesia morgani*, *Macrovipera lebetina*, *Pseudocerastes urarachnoides*.

Distribution

Carinatogecko ilamensis sp. nov. is as yet known only from the type locality in the Zarinabad region, Dehloran Township, Ilam Province, western Iran (Fig. 1).

Etymology

Carinatogecko ilamensis sp. nov. is so named as it has been found, for the first time, in Ilam Province, western Iran.

Comparisons

Comparison with the genus *Bunopus* Blanford, 1874

The new species described here, at first glance, is similar to *Bunopus tuberculatus* Blanford, 1874 in the absence of postmentals and, to some extent, in overall body pattern (Figs. 9-10a). In order to reveal distinguishing characters separating *C. ilamensis* sp. nov. from *B. tuberculatus*, some photographs from different body parts of both taxa were taken and compared (Fig. 10). For this purpose, specimens of *B. tuberculatus* deposited in the RUZM were analyzed and photographed.

In both compared species, postmentals are absent and the mental has an irregular rear edge, bordered by 3-7 smooth granular scales in *B. tuberculatus* and 6-7 keeled granular scales in *C. ilamensis* sp. nov. (Fig. 10a); dorsum covered by small, juxtaposed, smooth scales intermixed with enlarged, keeled, trihedral tubercles in *B. tuberculatus*, and tubercles are much larger than surrounding scales, while dorsum is covered by keeled scales intermixed with strongly keeled tubercles in *C. ilamensis* sp. nov., and dorsal scales are approximately half the size of tubercles (Fig. 10b); belly is covered with small, smooth, subcircular, juxtaposed scales in *B. tuberculatus* and by small, keeled, approximately subimbricate scales in *C. ilamensis* sp. nov. (Fig. 10c); preanal pores present in males of both species and separated from ventrals by several rows of scales, weekly developed in *C. ilamensis* sp. nov. and lower in number than those of *B. tuberculatus* (Fig. 10d); upper caudal scales smooth in *B. tuberculatus* and keeled in *C. ilamensis* sp. nov.; caudal tubercles more prominent in *C. ilamensis* sp. nov.

than in *B. tuberculatus* (Fig. 10e); ventral part of tail in *B. tuberculatus* covered by smooth scales and some scales are more or less platelike and larger than adjacent ones, while in *C. ilamensis* sp. nov. scales of ventral part of tail are keeled, not plate-like, and almost the same size (Fig. 10f). Table 1 represents comparison of some major morphological characters between these two taxa.

Comparison with the other species of *Carinatogecko* Golubev & Szczerbak, 1981

In order to compare *Carinatogecko ilamensis* sp. nov. with the other three species of *Carinatogecko* (*C. aspratilis*, *C. heteropholis*, and *C. stevenandersoni*), the material deposited at Razi University Zoological Museum (RUZM-GC.110 – RUZM-GC.131) was examined and combined with information obtained from the literature (e.g., Leviton et al. 1992; Szczerbak and Golubev 1996; Anderson 1999; Fathinia 2007; Rastegar-Pouyani et al. 2007; Červenka et al. 2010; Torki 2011).

Based on the comparisons, *C. ilamensis* sp. nov. differs from its congeners by a combination of characters as follows: The color pattern is different from those of *C. heteropholis*, *C. aspratilis*, and *C. stevenandersoni* and dark transverse bands on dorsum in *C. ilamensis* sp. nov. are equal to, or wider than, light interspaces (in all other three species the darker bands are much narrower than interspaces; Fig. 11); the most obvious character differentiating *C. ilamensis* sp. nov. from the other three mentioned species comes from postmentals. *Carinatogecko ilamensis* sp. nov. has no postmentals (two pairs in *C. aspratilis*, and *C. heteropholis*, and 3-4 pairs in *C. stevenandersoni*; Fig. 12); the mental is not pointed posteriorly in *C. ilamensis* sp. nov. (the opposite is true for the three other species; Fig. 12); enlarged dorsal tubercles extend onto nape and postorbital regions but absent on occiput in *C. ilamensis* sp. nov. (extending on to occiput, upper head, to between eyes, and onto temporal region in *C. stevenandersoni*; extend onto occiput and run out before reaching the interorbital region in *C. heteropholis*, and run out in the occipital region in *C. aspratilis*); Ventral scales not imbricate in *C. ilamensis* sp. nov. (strongly imbricate in *C. aspratilis*, weakly imbricate in *C. heteropholis*, weakly imbricate in *C. stevenandersoni*); ventral scales not pointed in *C. ilamensis* sp. nov. (pointed in *C. stevenandersoni*, not pointed in *C. heteropholis*, weakly pointed in *C. aspratilis*); scales posterior to the labials not enlarged in *C. ilamensis* sp. nov. (not enlarged in *C. aspratilis*, enlarged in *C. heteropholis*, much enlarged in *C. stevenandersoni*); dorsal scales equal to ventrals in *C. ilamensis* sp. nov. (larger in *C. stevenandersoni*, equal or smaller in *C. heteropholis*, equal in *C. aspratilis*); number of subdigital lamellae under fourth toe 16-18 in *C. ilamensis* sp. nov (16-20 in *C. stevenandersoni*, 15 in *C. heteropholis*); SVL 36.53 mm in largest specimen of *C. ilamensis* sp. nov. (41.10 mm in *C. heteropholis*,

less than 27 mm in *C. aspratilis*, 36.49 mm in *C. stevenandersoni*); all lower labials not divided in *C. ilamensis* sp. nov. (fourth and fifth lower labials divided in *C. stevenandersoni*, not divided in both *C. heteropholis* and *C. aspratilis*).

Summary

Carinatogecko ilamensis sp. nov. is a new taxonomic entity within *Carinatogecko* Golubev & Szczerbak, 1981 based on having the following distinguishing characters: 1) mental not pointed posteriorly, 2) postmentals absent, 3) dorsal dark crossbars are equal to, or wider than, light interspaces, 4) scales on upper side of forearm are homogeneous. These significant differences are indicative of profound divergence of *C. ilamensis* sp. nov. from other keel-scaled geckos of the genus *Carinatogecko*.

Biogeography

According to some workers (e.g., Macey et al. 1998, 2000; Rastegar-Pouyani 1999a, b, c; Rastegar-Pouyani and Nilson 2002), occurrence of important and drastic vicariant events, including uplifting of the Zagros and Elburz Mountains in the late Tertiary, 15-9 million years before present (MYBP), have affected distribution and speciation of many of the Iranian Plateau lizards such as *Asaccus*, *Laudakia*, *Uromastyx*, *Trapelus*, and others.

The keel-scaled geckos of the genus *Carinatogecko*, with four known species so far, are mainly found in the

Zagros Mountains and the adjacent foothills in western Iran. The first logical speculation concerning biogeography of the genus *Carinatogecko* is that they have had a widespread distribution as an ancestral taxon before the formation of the Zagros Mountains (15-9 MYBP). The Zagros orogeny has caused geographic isolation of ancestral populations leading to a reduced gene flow, providing great opportunities for genetic divergence and speciation in the keel-scaled geckos of the genus *Carinatogecko*.

Based on the available evidence, the Zagros Mountains can be regarded as the center of origin and diversification for *Carinatogecko*.

Key to species of the genus *Carinatogecko* Golubev & Szczerbak, 1981

Based on the available information (Leviton et al. 1992; Szczerbak and Golubev 1996; Anderson 1999; Fathinia 2007; Rastegar-Pouyani et al. 2007; Červenka et al. 2010; Torki 2011) and comparison of the examined material deposited in the RUZM, an updated key to the species of *Carinatogecko* is provided.

Diagnosis of the genus

All scales of the body, with exception of intermaxillaries, nasals, chin shields, and upper and lower labials, strongly keeled; three nasal scales contact nostril; digits weakly angularly bent, clawed, not dilated, not webbed, nor or-

Key to species of the genus *Carinatogecko* Golubev & Szczerbak, 1981

- 1a Postmentals absent *Carinatogecko ilamensis* sp. nov.
- 1b Postmentals present 2
- 2a Presence of 3-4 pairs of postmentals *Carinatogecko stevenandersoni* (Torki 2011)
- 2b Presence of two pairs of postmentals 3
- 3a Scales in middle of back distinctly larger than abdominals; caudal tubercles pointed, raised, with enlarged posterior facets; analogous dorsal tubercles present on forearms; 17-18 subdigital lamellae under the 4th toe *Carinatogecko aspratilis* (Anderson 1973)
- 3b Scales in middle of back negligibly smaller or alike in size to abdominals; caudal tubercles not pointed, posterior facets not raised; no analogous tubercles on forearms 4
- 4a Fifteen subdigital lamellae under the fourth toe; 11-13 bands on original tail *Carinatogecko heteropholis* (Minton, Anderson, and Anderson 1970)
- 4b Sixteen to seventeen lamellae under the fourth toe; nine bands across original tail *Carinatogecko cf. heteropholis* (Červenka, et al. 2010)

namented, with keeled transverse subdigital lamellae; dorsal pholidosis heterogeneous, small juxtaposed scales intermixed with tubercles; pupil vertical; tail segmented, caudal tubercles with bases in the middle of each segment, separated from posterior margin of segment by ring of scales (Anderson 1999: 144).

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